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MEDICAL CONSULTATION AT YALE-NEW HAVEN HOSPITAL

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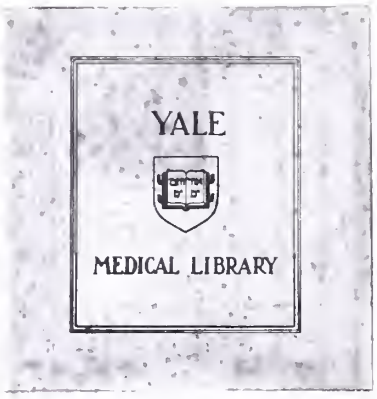
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MEDICAL CONSULTATION AT YALE-NEW HAVEN HOSPITAL

by

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A Thesis submitted to the Yale University
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of the requirements for the degree of
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DEDICATION

This thesis is dedicated to my parents, Nomi and Barbara Henes, whose love and support enabled me to make it this far.

ACKNOWLEDGEMENTS

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SUMMARY

This study examined a random sample of 251 medical consultations to non-medical services at Yale-New Haven Hospital over a one-year period. We found that the most common functions of the medical consultant were the management of clinical problems (61 percent of consultations) and the diagnosis of clinical problems (51 percent of consultations). We found that 52 percent of consultations were for the evaluation of previously diagnosed disease and that 37 percent required evaluation of abnormalities discovered on examination of the patient or abnormal test results.

We showed that more than 80 percent of consultations provided important aid in the diagnosis and management of patient problems, and that consultants provided such aid even when it was not specifically requested.

We found that consultations which provided close follow-up more often affected patient management than those which did not provide such follow-up; but that neither close follow-up, previous attempts at diagnosis, nor compliance with consultants' recommendations led to increased diagnostic efficacy of the consultations. Finally, we found that over one-third of the patients studied were seen by more than one medical consultant.

We concluded that consultation accounts for a large proportion of patient care delivered by internists, and that the information in this study could be utilized to direct the efforts of those concerned with teaching the consultation process to internists.

I. INTRODUCTION

Consultation plays an extremely important role in internal medicine today. As medical knowledge has mushroomed over the past several decades, medical subspecialists/consultants have become increasingly vital components of the health-care system. Pellegrino[1] states: "The Oslerian concept of the internist as an across-the-board consultant has become equally as pretentious as the specialist doubling as a generalist;" thus, the expansion of knowledge has created a need for increasing specialization within the field of internal medicine.

The major mode of contact with the health-care system for these specialists (when they act in that capacity) is through consultations with other physicians. In fact, about one-fifth of all internists' patient encounters are for consultation, and medical subspecialists spend even more time in consultation.[2] In addition, large proportions of the internist's training are spent on medical subspecialty services. For medical schools with a traditional curriculum, the fourth year is largely elective; the medical student interested in internal medicine will often spend over half this year in medical subspecialty electives. The internist's residency training consists of a three-year program, of which at least two years are spent as a physician with primary patient responsibility; in most programs, the remainder of time is elective, and most residents choose medical subspecialty services to fill that time. For the resident and student in each setting, a major portion of their time

is spent discussing and/or performing in-patient consultations.

Subspecialty fellows spend about sixty percent of their time in clinical activities,[3] predominantly consisting of activities related to consultation. In-patient consultation, like in-patient general internal medicine, is expected to provide adequate training in consultation for the medical subspecialist. Finally, in academic centers, a significant portion of the faculty's time is spent in performing consultations or attending on consultation services. Thus, consultation is a major function of the internist, both specialist and generalist, and occupies a large amount of time in the training of new internists.

Despite this fact, little research has been done on consultation among internists, and most of this has dealt with out-patient consultation among physicians in the community.[4,5,6] Less research has been done on in-patient consultation. The purpose of the present study is to form a descriptive framework of the in-patient consultation process as it occurs at Yale-New Haven Hospital. It attempts to describe both the demographics of the patients seen in consultations, the patterns of inter-specialty consultation, and the mechanics and outcome of the consultations performed. The study focuses on the purposes for which consultants are called, the consultant's recommendations, and the ultimate impact of the consultations on the patient's hospital stay.

A. Review of Literature

Since the literature on medical consultation is so scanty, it is instructive to review some of the work done on consultation in

other fields, such as business, education, social work, and mental health. Various definitions of the "consultation" have been suggested. Wolfe[7] calls it "the giving and taking of help in an interpersonal relationship." Boehm[8] offers "a process whereby expertise in knowledge or skill is made available for the purpose of help with the solution of a problem by the provider of consultation to the recipient of consultation...". Caplan[9] deems it "the process of interaction between two professional persons -- the consultant who is a specialist and the consultee who invokes the consultant's help in regard to current work problems with which he is having some difficulty and which he has decided are within the other's area of specialized competence." Thus, consultation provides for an interaction between two agents which facilitates solving of a work-related problem which the consultee has been unable to handle on his own.

From these definitions, we can proceed to clarify the role of the participants: the consultant and the consultee. A review of the literature[10] shows that consultants act in a wide variety of capacities, each of them called "consultation." In psychiatry and medicine, he may be a case problem-solver. In business, he may act as a planner, an organizations expert, or an expert in marketing, efficiency, or personnel. In education, he may act as an evaluator of teachers, a liaison between school groups, a program coordinator, or as an expert adviser on problem students. In nursing, the consultant may assist with policy decisions, program planning, or evaluation.

Wolfe[7] describes the role of the consultants thus: evaluating the problem, advising the consultee about solutions; teaching the consultee about future similar problems; and as a liaison amongst members of an organization or group of professionals. The consultant is usually an expert who is brought in to help with a problem which is beyond the expertise of the consultee; however, he may also be someone who facilitates a process of problem-solving already known to the consultee but which the consultee is unable to effect (e.g., by organizing a group of specialized engineers into a team to construct a missile). The role of consultant as expert problem-solver is central to the medical consultation model, as discussed below, but the latter role is quite common in the field of business, in which so-called "consulting" firms provide just this function.[11]

At other times, the consultant merely acts in a supportive role, confirming the consultee's own solution to the problem, or by giving the consultee confidence that his solution is reasonable. Consultants can be used, therefore, either by the supervisor or the consultee himself to help sanction solutions about which they have some question.

Teaching is an additional important role of the consultant, since by teaching the consultee, he may eliminate the need for further consultation for the type of problem which is present. Much of the teaching during consultation is done by example -- the consultee views the consultant's approach to the problem, then later copies this approach. Formal teaching may be added in an effort to strengthen these newly gained skills.

In most cases, the consultant is not formally empowered to implement his recommendations: that is left to the consultee. Supervisory personnel may put their authority behind the consultant; the consultant may also rely on his prestige. Gaupp[12] states "consultees who are faced with a high status representative from another profession about which they have little knowledge seem to see the alternatives as either accepting the consultant's recommendations and insights or facing the mystical disapproval of the entire alien profession."

In the last statement, we can see that the role of the consultant is partially determined by the consultee. Only if the consultee defers to the greater status of the consultant is the latter able to exercise his expertise meaningfully. The consultee is in a position to accept or reject the recommendations of the consultant, but if he does not recognize the consultant as an expert, then the underlying framework of the consultation is destroyed.[11] Of course, if the consultee accepts the recommendations, he must then implement them, acting as the agent for the consultant.

B. Classes of Consultation

A number of authors have developed classification systems for consultation; the relatively simple classification below was suggested by Caplan.[9] He saw four general classes of consultation:

1. Client-centered case consultation -- the consultant attempts to show the consultee how to help a third party, the client. The eventual goal of the consultation is to effect a

change in the client. (This is the pattern of consultation in medicine.)

2. Consultee-centered case consultation -- the consultant attempts to help the consultee understand why and how he is having difficulty with a particular case. The goal is to decrease the problems the consultee has in dealing with a case or client (an example of this type of consultation would be that of a psychiatrist attempting to overcome a schoolteacher's prejudices against minority students, in order for the teacher to be better able to help those students).

3. Program-centered administrative consultation -- the consultant shows the consultee (often an organization and not an individual) how to implement new programs or change old programs (an example might be a marketing expert consulted by a newly formed manufacturing concern).

4. Consultee-centered administrative consultation -- the consultant attempts to improve conditions of interpersonal and interdepartmental communication to facilitate the operation of an organization.

Others have suggested more complex schemes,[10,11] but these four classes cover most types of consultations, including the medical consultation which is the subject of this study. As can be seen, the relative amount of expert advice, teaching, and liaison work done by the consultant will vary with the type of consultation performed.

How does the process of consultation work? A simple consultation has many separable elements. Again, several authors have

developed descriptions of the process of consultation, mostly dividing events into several stages. Because of the wide variety in type and purpose among consultations, these descriptions cannot cover the entire range, but they do serve as general models of the interactional process involved in consultation. Maddux[13] lists five stages: (1) request for assistance -- consultee calls in the consultant; (2) development of rapport -- the consultant and consultee develop understanding of each other's goals and needs, and the problem is set out; (3) diagnosis -- the consultee offers any preliminary work he has done on the problem to the consultant and the consultant puts his expertise to work; (4) working through -- the consultant and consultee develop a set of possible solutions and critically evaluate these solutions; (5) termination -- the consultee decides on a course of action; alternatively, determination may come at any step in the consultation if one of the parties breaks away from the process without a solution being found. Tilles'[14] formulation has six stages: (1) recognition and statement of the problems; (2) quantitation of the seriousness of the problem; (3) knowledge of cause-effect relationships; (4) forming of multiple solutions; (5) choosing one solution; (6) effecting that solution. This study used written reports by the consultant and consultee as its data base. Another study, by Robbins and Spencer[15], utilized observations of consultations by the researcher to yield the following formulations: (1) exposition -- consultee gives information to the consultant about the problem; (2) reaction -- consultant interprets and clarifies

the problem; (3) summary -- the participants summarize their knowledge and make appropriate decisions based on it.

It is useful to examine these stages in greater detail. The initial "request for assistance" -- what Kadushin[11] calls "contact" -- involves the choice of a consultant. This may be by previous experience with a particular consultant, by referral, or by contacting a consulting organization which then chooses the consultant[11]. An organization such as a hospital may, in fact, have a built-in set of consultants.

What factors does the consultee weigh in choosing a consultant? Mannino and Shore[10] cite several factors in a review. Consultants who have had earlier experience with the particular type of problem at hand are often sought. In general, professional reputation and prestige in the field of expertise are often cited as reasons for a choice. Consultants may be chosen because they are well-known to the consultee, or have worked with him before.

We can also look at what has prompted the consultee to seek assistance. The most common reason, as noted above, is difficulty with a problem which is beyond the consultee's expertise. However, consultation may also have secondary purposes.[11] It may be used by one or more parties in an organization who have differing opinions, in order to solidify their positions in a dispute. It may also be used as a "stamp of approval" to increase the chance that the consultees' approach to the problem will be accepted by a wavering client. It can further be used to procrastinate on a decision.

Once the consultant is chosen and enters the next stage,

development of rapport, further problems can arise.[11] The consultant is an outsider who may be viewed with hostility by members of the consulting organization. The supervisor may view him as a rival for prestige among his workers. The workers may view the consultant as an unwanted force for change (e.g., an efficiency expert), or as someone who will increase their workload (when his recommendations have to be implemented). The consultee may see the consultant as taking over his duties, thus decreasing his own prestige. Therefore, most researchers have found that consultation works best when the consultant and consultee establish a cooperative, working relationship. A review[10] of research on personal qualities of the consultant that facilitate this found emotional stability, cooperativeness, pleasing personality, assuredness or ability to inspire confidence, and tactfullness to be traits of the ideal consultant.

In the next step, the consultee presents the problem to the consultant (exposition). At least part of this presentation may occur in writing prior to their initial meeting, necessitating preparation on the part of the consultant. The consultee, in any event, must carefully prepare for this exposition. It is critical that he be able to identify and define the problem and present the problem in an organized manner.[15] The facts which are presented and the format in which they are presented will likely influence the consultant's ability to solve the problem; if the problem is ill-defined, he may have difficulty in applying his expertise.

"Working-through", the next stage, involves the development of solutions to the problem through application of the consultant's knowledge in discussion between consultant and consultee. At this point, the rapport developed earlier is important to the interaction. Robbins'[15] "reactive" and "summary" stages combine here--the consultant reacts to the information given, analyzes the problem, and formulates solutions. In doing so, he may demonstrate to the consultee how future problems of this type may be approached. "Termination" comes when the consultee selects a proposed solution and implements it. At this point, the formal consultation is ended, but in many cases the consultant will view the results of implementing the solution with the consultee and make further suggestions. In fact, follow-up of results by consultants was found to be a desirable trait.[16]

Many studies have been done on the outcome of consultations. A problem in studies of this kind is defining a successful or unsuccessful outcome.[17] Dobson[18] looked at reasons for the failure of business consultation. Failure most often occurred when: (1) the consultants were not qualified; (2) consultees did not implement consultant recommendations; (3) consultants failed to adapt their views to differing situations. Another study[19] equated success in business consultation with several factors: a cooperative client, good consultant-consultee relationship, frequent evaluation, total candor on the part of the consultee in presenting the facts, and last, as above, in implementing the consultant's suggestions. Savage,[16] looking at educational

consultation, came to similar conclusions, finding that in successful consultations, consultant's recommendations were implemented.

Some quantitative studies using various testing batteries and questionnaires have shown variable results. One[20] showed that mental health consultation to a community center achieved equivalent results to direct mental health therapy (a positive result). Another study[21] examined two groups of college students; one group's advisers had been given psychiatric consultation about students' potential problems. The researchers found no difference in mental health between the groups of students. A third study[22] focused on psychiatric consultations to a welfare department; it found significant differences between a group of children who received psychiatric evaluation and were treated according to recommendations, and another group who also received consultation, but were not treated accordingly. Here we see that success of the consultation correlated with compliance with recommendations. Yet another study[23] of students showed that classes whose teachers received psychiatric consultation scored higher on I.Q. tests subsequently than did control groups. This result can be compared to a different study of psychiatric consultation to school teachers[24] which found no changes in the students; the only changes found in the study were in the teachers' understanding of psychiatric categories. Finally, Robbins, et al.[17] found a positive correlation between amount of consultation received by community health centers in planning a project and acceptance of that project for funding by the U.S. Public Health Service.

C. Research in Medical Consultation

With this background of reach in consultation, we can then approach the field of research in medical consultation. First, it is important to note that the medical consultation model is one of "client-centered case consultation." The client is the patient, and the consultant seeks to effect some change in his state of mental or physical health. The consultant is called in almost exclusively for the purpose of using his expertise in a specialized field unfamiliar to the consultee; there is little use of the liaison function except in certain psychiatric consultations. The consultant may be an individual practitioner or a member of a consultation service; the patient may be in the hospital or an out-patient. Contact between consultant and consultee as set forth above may occur directly (face to face), by telephone, or solely in written reports. Before reviewing the literature on purely medical consultation, it is useful to look at the research done in psychiatric consultation.

First, researchers have examined the reasons for consultation (beyond the basic one of needing expert assistance). Kaufman[25] found that sixty-one percent were for differential diagnosis, and twelve percent for ward-management problems. Several other studies[26,27] back up this observation; they also mention treatment and opinions about committment as frequent reasons for consultation. These latter two reasons require the psychiatrist to take a more active role in the patient's care.

Several studies[28,29] have examined the type of patients

referred. They found that these patients had a greater-than-average number of subjective complaints, usually about being "nervous"; that obviously psychotic patients were quickly referred; and that the referring physician (or consultee) would attempt to rule out organic disease before requesting a psychiatric consult. It was also found that the group of patients saw the psychiatric consultation in a favorable light. Many viewed it as evidence that their primary physician was indeed concerned with their emotional well-being as well as the state of their disease.

Few researchers have examined the recommendations of consultant psychiatrists and how they are implemented by the consultee. Nor has the outcome of such consultations been examined closely. A recent study by Popkin, et al.[30] looked at some of these factors. They studied psychiatric consultants' recommendations for psychotropic drugs, and found that in 68 percent of cases, consultees followed recommendations, in 24 percent they did not, and in 8 percent they only partially complied. They noted a greater degree of non-compliance with recommendations that were not specific (no dosage of drugs suggested) or involved a contingency (i.e., to check a test result before giving the drug). They point out that just those factors mentioned above as being important in determining the success of consultation in other fields, such as "status of the consultant" and "degree of prior contact between consultant and consultee" probably contribute to the rate of adherence with recommendations.

A number of authors have undertaken studies of the consul-

tation-referral process as it occurs in the community outside the realm of the teaching hospital. Saunders[6] reviewed the literature on "practice and process" of consultation-referral among family physicians. He notes the emphasis which both medical organizations and society place on proper use of consultation. For evidence of the former, he quotes a detailed set of guidelines established by the College of Family Physicians of Canada which prescribe the proper employment of consultation. He then refers to a study by Price[31] which questions a large group of people on what they found to be positive qualities in a physician. "Ranking fourth was the quality 'readily refers patients when it is to their advantage to do so'". He discovered referral rates ranging from 3.4 to 22 percent in various studies, with some evidence that younger physicians tend to refer more patients (either because of inexperience or because of greater use of technologic diagnostic tests which found abnormalities). Brock[5] found the opposite to be true; in her study, the more experienced physicians had a higher referral rate. She postulates that the less experienced physicians are less competent and less willing to have other doctors review their management of cases. The difference in the two studies may be attributed to two factors: (1) the extremely small sample in the study quoted by Saunders (3 patients); (2) a difference in the physician population studied. All the physicians in the study quoted by Saunders were community based; in Brock's study, the younger physicians were based in a family medical center, while the older, more experienced physicians were community based.

Shortell[4] points out that rates of referral are tied to the decision of whether to refer or not; but that patterns of referral are based on choice of consultant. Brock[5] found that the most common reasons for selecting a consultant were "good past experience for other patients," "having met and liked this person," and "have worked with this person," once again showing the importance of prior contact in determining the progress of consultation. Brock also tabulated the reasons for referral; topping the list were "second opinion for management," "lack of required facilities and/or skills," and "second opinion for diagnosis."

Shortell[4] analyzed reasons for referral according to exchange theory, which "explains human social behavior by focusing on the rewards and costs to individuals who choose to interact with one another."[6] Thus, a reward is a positive reinforcement to continue an activity (such as referral) and a cost is a negative reinforcement. The final outcome is predicted by subtracting the costs from the rewards. He considered the process of consultation and referral by picturing the sick patient as an unfinished product, sent by the consultee to the consultant to add his expert touch, providing the finished product: a healthy patient. The reward to both the consultant and consultee is obvious in such circumstances. Potential costs of the process for the referring physician are: losing a patient to another physician's care; patient dissatisfaction when the consultant is unhelpful; loss of status when the patient's prior management is scrutinized; and loss of time involved in preparing information on and communicating with the

consultant. Potential costs for the consultant include: getting a patient who is a malingerer; loss of status if he is unable to find a solution; receiving inadequate information from the consultee about the patient's prior work-up and about the purpose of the consult. (In fact, Kunkle's study[32] notes a failure to supply adequate patient information to the consultant in 50 percent of his series of referrals; and Saunders makes a plea for more formal teaching of the referral process, especially in stressing ample communication of relevant facts of the case to the consultant prior to sending him the patient.) Shortell similarly points out a multitude of possible subjective benefits from consultation besides the major objective benefit of a healthier patient. By polling a large number of physicians, he sought to test various hypotheses about the referral process, using exchange theory as a framework. Unfortunately, almost all his conclusions either did not support the hypotheses or, in fact, refuted them. However, his study remains the only one that attempts to develop a predictive model for the subjective behavior involved in the early stages of consultation.

D. In-Patient Consultation

As noted earlier, only a handful of studies has sought to describe or investigate the process of in-hospital consultation. Before we review these, it is important to have some insight into why more such investigations are crucial.

In the 1970's, public and governmental concerns over the costs of health care in the United States led to concern over the

allocation of health manpower. This has spawned several nation-wide studies[2,3,33-37] aimed at carefully quantifying information about physician's practices, both in the community and in the teaching hospital -- as a "prerequisite to the elaboration of a rational health manpower policy in the future."[33] So far these studies have focused much of their attention on the quantitation of "primary care" provided in different settings, and by different types of physicians; they have also focused on the preponderance of subspecialists who populate the field of internal medicine. At the same time, a great debate has sprung up over the proper training of the general internist and his place in the "primary care" sector.[1,38-43] Concern has arisen over the costs of subspecialization and the mushrooming medical technology[44] they employ. Peer review, medical audits, and studies of cost-effectiveness are becoming more and more common as people try to find rational ways to approach the spiraling health process.

It is against this background that the importance of studying medical in-patient consultation becomes apparent. Earlier it was demonstrated that in-patient consultation is a major part of the training of the general internist; Byyny, et al.[38] stressed the importance of an internal medicine consultation service in developing a department of general internal medicine. They also quote Petersdorf[45]: "In a specialized setting, medicine on the wards is often practiced by a committee of consultants." The new practicing physician can only draw on his in-patient experience in developing his own referral and consultation methods.

As Moore et al.[46] state: "An internal medicine consulting service can provide valuable experience in the social dynamics of the consultant's role and the necessary skills to fulfill this role". In-patient consultation is, therefore, important in understanding all forms of medical consultation.

In addition, consultation (both in-patient and out-patient) adds a substantial cost to health-care. Both the consultation itself and the inevitable tests and procedures which follow inflate the cost of care. It has been shown in at least one institution[47] that patients on teaching floors undergo many more tests than those on private floors, resulting in increased costs. Likewise, patients on subspecialty floors generally will have an increased number of tests ordered.[48] As costs rise, the question should be asked, do these consultations have any impact on the patient's outcome? That is, is the added cost worthwhile in terms of increased survival, decreased morbidity, or even increased diagostic accuracy? Again, only by studying the reasons for consultation, the types of recommendations made, the implementation of these recommendations, and the results for the patient will we be able to critically assess the role of consultation in medical care.

Finally, by making such an assessment, we can further define the role of the generalist as a consultant -- a role which must expand as the health care system develops a more hierarchial structure. The general internist can serve as hospital consultant for family practitioners, nurse practitioners, physicians' assistants, and the like, reserving only the more specialized cases for

the subspecialist. As costs rise, the present all-too-common practice of patients seeing an endocrinologist for diabetes, a cardiologist for angina, and a pulmonary specialist for bronchitis would put too much strain on the system.

Spoerl[49] investigated the difficulties encountered in consultations among physicians. He pointed out that "the incidence of misunderstandings, mistakes, and resulting hurt feelings on the part of all parties involved appears to be much higher in consultation work than in other doctor-patient and doctor-doctor relationships." He examined the stresses put on the individuals involved: the patient, the doctor (consultee), and the consultant. The patient may lose confidence in his physician; he also may resent the consultant (especially in a teaching hospital where the patient is treated as an "interesting case" and consultants are called for "interest" only). Conversely, he may not understand who the consultant is, or whether he is the primary physician on the case. The doctor may have ambiguous feelings about turning the patient over to a subspecialist for management and thus may misuse the consultant; he also may use the consultations to put off difficult decisions or to uphold his views in a situation of conflicting opinions (see above). The consultant must deal with his own conflicts about how much of the care of the patients he would like to assume -- some prefer total control, others merely to operate, as it were, from afar. Spoerl concludes that many of these problems could be avoided by "clarification of the roles of the participants before the consultation takes place,

including providing a straightforward consultation request and informing the patient about the consultant."

Several studies have looked at referral patterns in inpatient consultations. Moore et al.[46] detailed both the source of consult requests from an internal medicine consultation service in a teaching hospital, and the medical problems for which the patients were referred. In their experience, orthopedic surgery accounted for 22 percent, obstetrics-gynecology for 21 percent, and otolaryngology for 12 percent, and the remaining surgical specialties for 23 percent. The types of problems seen were classified by subspecialty, with cardiology accounting for 16 percent, endocrinology 13 percent, rheumatology 18 percent, hypertension 12 percent, and pulmonary 10 percent, with other categories making up the remainder. Deyo[50] describes a similar service; 63 percent of their consults were to surgical services, 20 percent to psychiatry, and 10 percent to gynecology. Again, the major reasons for consultation were cardiology, (38 percent), hypertension (16 percent), diabetes (10 percent), and pulmonary disease (8 percent). He also points out that almost half (45 percent) of their consultations were for preoperative purposes. Last, he notes that 15 percent of the patients had multiple organ-system problems, an ideal situation in which to employ a general internal medicine consultant. Burke and Corman[51] describe their experience with a general medicine consult service. They found, after several months of operation, that they consulted mainly to orthopedics (23 percent), general surgery (19

percent), otolaryngology (14 percent), and gynecology (11 percent). They also described the pattern of consultation in medical specialty services in their hospital, noting the greatest number of requests to cardiology and gastroenterology (13 percent each), pulmonary (11 percent), and infectious disease (11 percent). It is important to note that the services of orthopedics, gynecology, and otolaryngology in all these studies appear to utilize general medicine consultation most frequently. The problems most frequently seen appear to be in cardiology, endocrinology and hypertension, and pulmonary disease. However, the number of consults in different services and the types of problems seen reflect not only the actual patient population, but also established biases among consultees as to whom to consult for a particular type of problem: a generalist or a subspecialist. Thus, a small number of general medicine consults requested by urology may reflect the urologist's preference to deal with nephrologists rather than generalists. Likewise, a low number of consults referred for renal problems might reflect a very competent renal subspecialty service which is highly respected by the hospital staff.

A number of studies (including several of those above) have examined the actual mechanics or process in consultation. Perlman[52] and Rudd[53] both analyzed the reasons for consultation. Perlman, in a chart review of 75 consultations on an in-patient pulmonary consultation service, found that 52 percent of consultations were requested for diagnosis alone, 47 percent for diagnosis

and therapy, and 1 percent for therapy alone. Rudd studied the records of 17 consultations on diabetic patients seen perioperatively by members of a general internal medicine consultation service. He found that 47 percent of their consults were for therapy alone, 29 percent for diagnosis and therapy, and 12 percent for preoperative surgical clearance. Part of the large difference in number of consults for diagnosis can probably be attributed to the fact that the Rudd study selected only patients who were previously diagnosed diabetics.

Three studies[38,46,53] mention that the delay between request and consult was held under twenty-four hours, although Rudd notes one consultation which was delayed thirteen days! Rudd also points out that the patients in his study had a median hospital stay almost twice as long as the average hospital patient; he does not assess whether this was due to the consultation, or whether this reflected a sicker patient population who received consultation. It is interesting to note that about 60 percent of his patients were consulted on by other services, which would support the latter conclusion.

Several authors comment on communication in consultation. In Burke and Corman's study[51] they outline the lines of communication during a consult: (1) "a brief note of assessment and recommendations"; (2) "an attempt to establish contact either personally or by phone with the physician"; (3) a dictated complete evaluation; (4) daily follow-up; (5) joint decisions on discontinuing follow-up with the physician; (6) personal intervention by the consult service

attending if disagreement occurs. Schrag and Baumann[54] note the necessity of the ward attending's involvement with house staff in the assessment of consultant's recommendations; they found advice was often necessary in "tempering recommendations in accord to their own unique knowledge of the patient's special characteristics." Rudd noted failure to provide promised follow-up in one fifth of cases. He also points out that "one-third of the studied consultations revealed poor question definition by the requesting service, inadequate response by the consulting service to the explicit questions, or mutual conception of the consultation function as 'the internist handles the diabetes while the surgeon handles the operation'". His study also stresses the need for explicit recommendations by the consultant, implying that this would improve adherence by the consultee. Rudd also found that standards for perioperative diabetic control (which had been developed as part of his study) were not followed by his consultants. He concluded that this would decrease the teaching value of the consultation to the consultee by not providing the proper example of management technique. Thus, these researchers have found that accurate intercommunication and repeated exchange of ideas is vital to the success of consultation in medicine, just as it was found to be in other fields (see above).

Bleich[55] provides an interesting counterpart to research on medical consultation in his development of a computer program to provide consultation on electrolyte and acid-base disorders. By

analyzing the thinking process of the consultant on such disorders, and translating it into a computer program, he has provided information on the mechanics of consultation. In addition, he reports that "some physicians have told us they no longer need the program for certain disorders" -- the program, by providing a lucid model for the logical approach to such problems, has succeeded in the "teaching" function of the consultant as set forth by Wolfe.[7] Both Perlman and Rudd examine what Perlman calls "diagnostic process" and "therapeutic process" -- that is, recommendations for diagnosis and therapy made by the consultants. Rudd noted "diagnostic additions" in 41 percent of his cases, and therapeutic contributions in 88 percent of cases. He also tabulated the type and frequency of tests ordered by the consultant and their costs to the patient. Perlman went further in his analysis. His reviewers first judged the adequacy of the diagnostic work-up performed by the consultants and found 92 percent of these work-ups adequate. Of the cases in which the "diagnostic attempt" was adequate, he found that 75 percent made a correct diagnosis, 12 percent an incorrect diagnosis, and 13 percent could not be judged properly. It should be noted that the cases in which the diagnostic work-ups were judged inadequate all yielded inaccurate diagnoses. In the same study, 57 percent of the consultants made therapeutic recommendations of which 95 percent were deemed appropriate.

Outcome of consultations should be a major concern of future studies. As Rudd points out, as cost becomes a more important factor,

a medical community should "place more pressure on consultants to make their input more cost-effective, demonstrably decreasing mortality, morbidity, or length of hospital stay." Both Perlman and Rudd examined outcome as well as process. Rudd determined that 71 percent of his patients showed clinical improvement, 12 percent deterioration, and 17 percent no change or uncertain. He is quick to add, though, that only 38 percent experienced no complication perioperatively and had a normal length of stay. Perlman found that 51 percent of his therapeutic suggestions produced a positive outcome, 5 percent a negative outcome (the same patients for whom therapeutic recommendations were inappropriate -- see above), and 44 percent showed no change. He also found a marked difference in therapeutic outcome between patients who had accurate diagnoses (43 percent positive outcome) and those who had inaccurate diagnoses (4 percent positive outcome). Among controllable factors contributing most to therapeutic failure were diagnostic error and failure to adhere to consultant's recommendation.

This past work has only scratched the surface of possible research in the field of medical consultation. The present study attempts to examine some of the facets explored in these studies, as well as several others which may be relevant to the consultation process.

Like the previous studies, we examine the demographics of consultation in our hospital. The spectrum of consulting services and services requesting consultation is detailed, as well as the

characteristics of the patients seen. As above, we enumerate the purposes for which consultation is requested.

However, this study explores the area of consultation in greater breadth and depth then previous studies. We do not restrict the study to one specialty or to one small group of patients; rather, we examine the consultation performed by every division of Internal Medicine on all types of patients. We examine the mechanics of consultation more closely than others, detailing the degree of training of the consultants; amount of follow-up care; the type of information provided by the consultee to the consultant; the type of recommendations made by consultant; and the degree of compliance with such recommendations. We analyze the factors in the patient's hospital course which induce the consultee to request aid. Most importantly, we focus on the diagnostic and therapeutic impact of the consultation process on the patient, in an attempt to draw conclusions about the efficacy of consultation in our institution.

II. MATERIALS AND METHODS

This study collected data on a random sample of inpatient consultations performed by the Department of Internal Medicine (comprising the divisions of General Medicine, Hematology, Oncology, Cardiology, Infectious Disease, Gastroenterology, Endocrinology, Nephrology, Pulmonary Disease, Liver Disease, and Rheumatology and Immunology) on patients admitted to non-medical services (comprising the departments of General Surgery, Orthopedic Surgery, Cardiovascular and Thoracic Surgery, Neurosurgery, Urology, Pediatric Surgery, Plastic Surgery, Otolaryngology, Neurology, Psychiatry, Pediatric Medicine, Obstetrics and Gynecology, Dermatology, Ophthalmology, and Radiation Therapy) at Yale-New Haven Hospital. It was decided to limit the study to medical consultations of non-medical patients, since consultation on non-medical patients is a primary function of the general internist. In addition, it was felt that any impact of the consultation process on patient care would be most evident under conditions which maximized the difference between the field of expertise of the consultant and that of the consultee.

The consultation records of the Department of Internal Medicine were examined and a list was compiled of 2566 in-patients seen in consultation by the Deparment of Internal Medicine at Yale-New Haven Hospital during the one year period from October 1, 1978 to September 30, 1979. Eight of the divisions of Internal Medicine (Hematology, Oncology, Cardiology, Infectious Disease, Gastroenterology, Endocrinology, Rheumatology/Immunology, and Liver Disease) had kept lists of all consultations which were processed through their

departmental offices (i.e., by a telephoned request for consultation or by a consultation-referral form sent to the office). Requests for consultation made directly to full-time university faculty (bypassing the departmental offices) were not noted on these lists (an exception to this is the division of Cardiology), nor were consultations made by private physicians on the clinical faculty. However, these consulting services estimate that such unlisted consultations account for less than 5% of the total.

The other three divisions(General Medicine, Pulmonary Disease, and Nephrology) did not keep logs of patient consultations. In order to study a sample of the consultations performed by those services, microfilmed billing records (kept by the Office of Professional Services at Yale-New Haven Hospital) of the full-time faculty in those divisions were examined and a list was compiled of all patients billed for an initial inpatient consultation during the specified time period. Billing records from October 1, 1978 through January 31, 1980 were examined, in order to include any consultations for which billing might have been delayed. Although it is possible that some consultations during the period of the study might have been billed at a time after January 31, 1980, it is unlikely: of the 583 consultations during the study period from those three services, only five were billed to patients later than four months after the consultation took place. The list of consultations by General Medicine, Pulmonary Disease, and Nephrology, therefore, include <u>all</u> consultations seen by full-time faculty in those divisions, not just those processed through the central offices

of those divisions. Like the lists from the other eight divisions, this list would not include consultations by private physicians on the clinical faculty. The list of consultations by the division of General Medicine substantially underestimates the total number of consults requested from that service. This occurred because consults are often seen only by a senior medical resident, who uses his own discretion whether to discuss the problem with an Attending Physician. Senior residents estimate that for each consult seen with an attending, two to four consults are seen without an attending. All patients seen in consultation by the division of Pulmonary Disease are seen by an attending physician on the full-time faculty: thus, the list derived from the billing records for that division includes all consultations by that division. The division of Nephrology estimates that approximately 90% of their consultations are seen by an attending physician.

The entire list of 2566 inpatients seen in consultation by the divisions of the department of Internal Medicine was next divided into two categories: those inpatients who had been admitted to the Internal Medicine service and those who had been admitted to non-medical services. The service to which a patient had been admitted was determined either directly from the lists provided by the consulting services or by examination of computerized lists, kept in the hospital's Medical Records Department, of all hospital admissions from January 1978 through December 1979. Because of clerical errors or lack of information it was impossible to document

the hospital services to which eleven of the inpatients on the list had been admitted. By this method, it was found that 1174 patients had been seen on medical services, and 1381 had been seen on non-medical services.

A count was made of the number of consults by each division to the non-medical services (see Table 1), and a random sample of 251 consultations was selected. First, for each consulting service the number of consults to be examined was calculated by the formula

$$C \times \frac{s}{N}$$

where C represents the total number of consults to non-medical services by a given consulting service: s equals the total number of consults to be examined in the study (251): and N equals the total number of consults to non-medical services (1381). This provided a sample stratified by consulting service. The list for each service was then numbered and the predetermined number of consults was selected from the list by using a table of random numbers (CRC Mathematical Tables). The medical records of these patients were then requested from the Medical Records Department. If the charts could not be located by that department, further consults were randomly chosen from the consult lists, and requested, until the predetermined number of consults for that service had been reviewed. The charts of psychiatric patients were not available to us, so that consultations on these patients were excluded from the study.

Specific data was collected from the hospital chart by use of a special Extraction Form (Appendix I-A). Its purpose was to serve as the first step in the translation of material from the charts into a form which could be analyzed by computer. Most of the extraction form was constructed to incorporate data according to the method of "homologous conversion"[56] - the data on the Extraction Form generally has a one-to-one correspondence with that in the hospital chart; much of it, in fact, is in verbal form directly transcribed from the chart. After the design of the Extraction Form and the initiation of data collection, it was decided to collect certain other data, listed in Appendix I-B, for which space had not been assigned on the original Extraction Form. This data was collected for all consults reviewed. Appendix I-C shows the criteria used for extracting data from the chart onto the extraction form. These criteria were developed by the author in two ways: first, by constructing a set of explicit (previously determined) rules for transferring data from the chart to the Extraction Form (e.g. the rules for "adherence with recommendations"); second, by developing implicit rules, consisting of a very general rule inferred from specific situations (e.g. the rules for "impact on diagnosis"). Such implicit rules were found by Brook and Appel[57] to be useful in assessing quality of patient care; they point out that "the reliability of the implicit approach was not sufficient to predict accurately whether or not a single patient received acceptable care, but *was sufficient to evaluate a group of cases.*" (My Italics).

All the extractions were performed by the author. The hospital charts and the consultation lists were the sole source of information about the consultations studied. Certainly, some of the data involved in consultation may be communicated face-to-face, without being written down; however, since the consultation process as it exists at Yale-New Haven Hospital does not guarantee such contact, we felt that all information pertinent to the consultation should be written in the chart, and that failure to place information in the chart could be interpreted as failure to communicate that information.

After the extractions were completed, a Coding Form[58] (Appendix II-A) was developed in order to translate the raw data on the Extraction Form, much of it verbal, into digital form for computer analysis. The author developed a set of coding criteria (Appendix II-B) in the same manner as for the set of extraction criteria, by the use of explicit and implicit rules. Each extraction was coded by the author; the information from the coding form was transferred to Hollerith cards and analyzed on an IBM 370 computer using an SAS program; additional data analysis was performed on an IBM card sorter.

III. RESULTS

The results of the study are presented in Tables 1 through 19.

A. Characteristics of Patients and Distribution by Consulting Services

The patients in our study had a mean age of 54 ± 19 years (± standard deviation), with a range of ages from 4 to 98 years. The average length of hospitalization was 22 ± 19 days (± standard deviation) and ranged from one to more than 99 days. The distribution of length of hospitalization is skewed toward longer stays, reflecting a substantial group of the patients studied who had long hospital stays. Eighty-seven percent of the patients were white and 13 percent black; 58 percent were male; and 34 percent were ward patients.

From Table 1 we can see that the division of cardiology sees by far the largest proportion (32 percent) of the 1381 non-medical patients seen by medical consulting services. However, if we examine the total number of consultations to the Internal Medicine service (1174 consultations) we see that infectious disease consults account for the greatest percentage (25 percent). Examining the source of consultation requests to individual medical consulting services, we see that the divisions of pulmonary disease, infectious disease, liver disease, and rheumatology/immunology each perform more than 60 percent of their consultations on Internal Medicine patients; that the

divisions of general medicine, cardiology, endocrinology, and oncology each perform more than 59 percent of their consultations on non-medical patients; and that the other divisions (nephrology, gastroenterology, and hematology) see approximately equal numbers of patients from both medical and non-medical services.

Table 2 depicts the distribution, by requesting service, of the consults studied. The surgical divisions account for three-fourths of the consult requests. Table 3 shows the distribution of consults by consulting service: cardiology is ranked first, with 32 percent of the 251 consults; infectious disease is second with 13 percent; and gastroenterology is third with 10 percent.

B. Consult Demographics

Table 4 shows the stimulus for consultation (i.e. the event or set of data which induced the requesting service to ask for a consultation) in the cases studied. Thirty-six percent of 251 patients were seen solely for the evaluation of disease which had been diagnosed prior to hospitalization, and 16 percent were seen solely for the evaluation of disease which had been diagnosed during the present hospitalization. Thirty-seven percent were seen exclusively because of an abnormal laboratory test result and/or abnormal signs or symptoms; 19 percent of patients were seen for an abnormal lab test result alone. However, analyzing the data by consulting

services, we found that 60 percent (9 of 15) of endocrinology consult requests and 54 percent (7 of 13) of hematology consult requests were stimulated by abnormal test results alone. For the other consulting services the percentage of consult requests stimulated by abnormal lab test results alone was consistent with the mean value for all services.

Consult purpose (i.e. the type of consultant intervention specified by the requesting service — see Appendix I-C) is depicted in Table 5. We found that very few consultations were for the purpose of performing a procedure (3 percent), and that the large majority (65 percent) of consultations had diagnosis and/or management as their only purpose.

Table 6 lists the purposes for consults by consulting service. Since some consults had more than one purpose (e.g. diagnosis and management), the total number of purposes exceeds the number of consults for each service. The divisions of general medicine, nephrology, infectious disease and oncology each had therapy or management as a consult purpose in over three-fourths of their consults. Nephrology, hematology, and infectious disease each had diagnosis as a consult purpose in more than two-thirds of their consults. A large proportion of the cardiologists' consults (66 percent) had pre-operative evaluation as a purpose. Finally, 38 percent of gastroenterology consults and 30 percent of liver disease consults requested a procedure.

The data base collected by the requesting service before

the arrival of the consultant was found to be adequate in 86 percent of 251 consults, inadequate in 7 percent, and partially adequate in 9 percent. The division of cardiothoracic surgery provided adequate pre-consult information in only 72 percent of 68 patients; the other requesting services, considered together, provided adequate information in 92 percent of 183 patients.

Further consultation demographics were collected for the 251 consults studied. Consultants saw patients on the same day as the consultation request in 67 percent of cases (167 consults); on the next day in 29 percent (73 consults); and more than a day later in 4 percent (11 consults). Table 7 shows the relative numbers of consults initially seen by physicians and physicians-in-training at several levels. The proportion of patients seen initially by students varied from none (for endocrinology, liver disease, oncology, and rheumatology/immunology) to 38 percent (for cardiology, N= 80). Ninety percent of the 251 patients were seen by an attending physician as part of the consultation.

Table 8 gives the distribution of follow-up notes by consulting service. It should be noted that 13 of 14 nephrology patients (93 percent) and 7 of 10 liver disease patients (70 percent) received more than one follow-up note. Overall, 45 percent of the 251 patients received more than one follow-up note.

Table 9 shows the average length of hospital stay for

patients seen by each service, as well as the percentage of patients seen by each service who received other medical consultations. Patients seen by gastroenterology, hematology, and infectious disease had the longest average hospital stay; patients seen by liver disease, endocrinology, and hematology were most often seen by other consultants. Separating the entire group of patients studied into two groups, we found that patients receiving one medical consult (N = 161) had an average stay of 17 days, whereas those receiving more than one consult (N = 90) had an average stay of 32 days.

Post-operative problems were seen in at least 16 percent of the patients studied, while another 10 percent of the patients had problems which occurred post-operatively but may not have resulted from the surgery. Post-operative problems were seen by the cardiology service in 41 percent of their 80 consults, and by infectious disease in 23 percent of their 32 consults.

C. Diagnostic and Therapeutic Recommendations

Consultants noted problems additional to the ones they were called in for in 21 percent of all consults studied. The general medicine service found additional problems in 56 percent of their 18 patients. Management recommendations on these additional problems were suggested by the consulting service in 85 percent of cases in which additional problems were diagnosed.

Table 10 shows the diagnostic recommendations made by each service. Consultants made a total of 379 diagnostic recommendations in 183 consultations; 68 consultations had no diagnostic recommendations. Overall, the most commonly ordered of the 379 diagnostic recommendations were blood tests (34 percent), radiologic tests (22 percent) and body fluid tests (17 percent). Almost all the consulting services frequently utilized blood tests, especially general medicine, endocrinology, hematology, and rheumatology. Otherwise, pulmonary disease most frequently used radiologic tests and physiologic function tests; nephrology used body fluid tests; infectious disease used radiologic tests and body fluid tests; and gastroenterology used endoscopy. Cardiology most often recommended radiologic tests and physiologic function tests; liver disease and oncology both used radiologic tests frequently; and hematology often relied upon biopsy as a diagnostic tool.

Table 11 lists compliance with consultants' recommendations. There were 371 diagnostic recommendations for which compliance was possible in the 183 consults which contained diagnostic recommendations. Eight of the diagnostic recommendations were considered impossible to comply with. The coding categories "done totally by requesting service" and "done partially by requesting service" were combined for this table. Overall, 12 percent of the 371 diagnostic recommendations were not complied with, even in part. Twenty-four percent of

radiologic test recommendations were not carried out. Of the consultants' recommendations that were complied with and required interpretation (222 recommendations), 80 percent were interpreted. Ninety-five percent (40 of 42) of tests which the consulting service carried out themselves were interpreted, while only 77 percent (138 of 180) of those carried out by the requesting services were interpreted. A breakdown showing the percentage of diagnostic recommendations interpreted, for each consulting service (Table 12), shows that cardiology (35 percent), infectious disease (28 percent), and nephrology (26 percent) most frequently failed to interpret diagnostic recommendations.

Table 13 shows the type of management recommendations made and the type of therapeutic manipulations suggested by the consulting services. There were 367 management recommendations made in the 206 consults which had at least one management recommendation. Recommendations about drug manipulation accounted for two-thirds of the 367 recommendations; while recommendations about surgery made up one-sixth of all recommendations. The most common type of therapeutic manipulation was to initiate therapy (41 percent of recommendations) or to continue therapy without change or as planned (20 percent). Almost one-half of the 245 "drug" recommendations were for the initiation of therapy; ninety percent of the 63 "surgery" recommendations were to continue with surgery as planned; and two-thirds of the 17 "transfusion" recommendations (which

include both transfusions and the administration of intravenous fluids) suggested continuing therapy in a modified manner.

For therapeutic recommendations where it was appropriate to recommend a dose, no dose was supplied 19 percent of the time (38 of 195 recommendations); in cases where a duration or endpoint for therapy could have been suggested, 19 percent of the recommendations (37/199) gave no suggested duration of therapy.

Table 14-A shows the degree of compliance with management recommendations for the 360 recommendations that required compliance (in 7 recommendations compliance was impossible). Ninety-one percent of these recommendations were complied with. A statistical analysis (Table 14-B) of compliance with management recommendations by type of therapeutic manipulation ("start" orders vs. orders to "stop," "continue changed," "continue unchanged," etc.) shows no significant difference in compliance with "start" recommendations (88 percent) as opposed to other types of manipulation (93 percent). Also shown is a table (Table 14-C) of compliance, comparing recommendations in which either a dose or a duration for therapy had been suggested to those in which neither dose nor duration had been suggested. Compliance with recommendations was significantly higher in the former group (91 percent vs. 64 percent; $\chi^2 = 12.70$, $p < .005$).

4. Diagnostic and Therapeutic Impact

Table 15 shows impact on diagnosis in the 129 consultations

for which diagnosis was a specified purpose. In the table, 86 percent of such consults had a positive diagnostic impact (i.e. made a new diagnosis of the problem or changed the requesting service's diagnosis; confirmed the requesting service's diagnosis; or ruled out another possible diagnosis — see Appendix I-C).

> Example: The General Surgery service requested a consultation from the Hematology service on a 76 year-old white female who presented to the hospital with painless jaundice and had undergone choledocho-jejunostomy for a pancreatic tumor. The patient had not shown the expected leukocytosis after her operation; this resulted in the consult request. The Hematology service ascribed the lack of leukocytosis to an adult respiratory distress syndrome with concomitant margination of white blood cells in vessels, as well as to splenic sequestration of white cells.
>
> Comment: This consultation was requested for diagnostic purposes and provided a new diagnosis for the patient's problem.

Similarly, Table 16 shows that even consults which did not list diagnosis as a purpose had a positive impact in 30 percent of cases.

Several hypotheses about factors possibly contributing to diagnostic impact were evaluated further. We found that neither close follow-up, adequate pre-consult data base, nor compliance with diagnostic recommendations had a statistically significant effect on diagnostic impact. It was found that 87 percent (52/60) of consults with one or fewer follow-up notes had a positive diagnostic impact, while 95 percent (60/63*) of those with two or more follow-up notes had a positive impact; however, this difference was not statistically significant (χ^2=2.77, P >.05). Additionally, 91 percent (105/115) of consults with an adequate pre-consult data base had a positive impact, while 88 percent (7/8*) of those with an inadequate or partially adequate data base had a positive impact; again, the difference was not statistically significant (χ^2=.13, P>0.1). Finally, 91 percent (82/90) of diagnostic consults in which all diagnostic recommendations were complied with had a positive diagnostic impact, whereas 90 percent (18/20**) of those in which some diagnostic recommendations were not complied with had a positive impact; again, the difference was not statistically significant (χ^2=.02, P>0.1).

Finally, Table 17 shows impact on management in the 152

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*Six diagnostic consults had impact coded as "uncertain."

**Six diagnostic consults had impact coded as "uncertain;" 13 made no diagnostic recommendations.

consults for which management was a stated purpose; 64 percent of such consults changed the management of the problem for which the consult was called, while 18 percent confirmed the current management of the problem by the requesting service.

Example: The Orthopedics service requested a consultation from the Infectious Disease service on a 21 year-old white male who had undergone incision and drainage of a septic hip 3½ weeks earlier, and was being treated with intravenous vancomycin. The patient developed a rash at the drug infusion site; the consultee requested, "Please evaluate and advise." The consultant diagnosed the problem as an allergic reaction to vancomycin and recommended discontinuing the drug; this was done.

Comment: The consultation was requested for aid both in diagnosis and management; it changed the management of the patient and led to a diagnosis of the patient's problem.

Even among the 99 consults which did not list management as a purpose, 47 percent had a positive impact on management (either by changing or confirming management).

Example: The Dermatology service requested an Infectious Disease consult for the question of a septic joint in a 70 year-old white male with

pemphigus foliaceus, on methylprednisolone. He spiked a temperature of 101° F. and then developed cellulitis over the left elbow; this led to the request for consultation. The consultant confirmed the diagnosis of cellulitis without joint involvement and recommended treatment with intravenous oxacillin, 4 gm./day for 10 days.

Comment: Although this consultation was requested for diagnostic purposes, the consultant also recommended therapy, which was instituted. In addition, the consultation provided diagnostic information, since the consultant confirmed the present diagnosis of cellulitis and ruled out joint involvement.

An analysis of impact on management in two groups of consults (Table 19) showed that a significantly greater proportion of consults with two or more follow-up notes had a positive impact than did those with one or fewer follow-up notes ($\chi^2 = 6.01$, $P < .05$).

TABLE 1. Pattern of referrals to Department of Medicine*

Consulting Service	Requesting Service: Internal Medicine	Non-Medical Services	Unknown	Total
General Medicine	0	97	2	99
Pulmonary	196	122	4	322
Nephrology	83	76	3	162
Infectious Disease	294	176	0	470
Gastroenterology	126	134	0	260
Cardiology	87	443	1	531
Endocrinology	57	83	0	140
Liver Disease	122	56	1	179
Hematology	52	65	0	117
Oncology	42	78	0	120
Rheumatology/ Immunology	115	51	0	166
Totals	1174	1381	11	2566

* October 1978 through September 1979.

TABLE 2. Requesting services

Requesting service	Number of consults (% of total)
General surgery	56 (22%)
Surgical subspecialties (all)	135 (54%)
Cardiothoracic	68 (27%)
Neurosurgery	19 (8%)
Urology	14 (6%)
Orthopedics	13 (5%)
Plastic	11 (4%)
Otolaryngology	10 (4%)
Neurology	19 (8%)
Dermatology	18 (7%)
Obstetrics-Gynecology	12 (5%)
Other*	11 (4%)
	251 (100%)

*Ophthalmology, Pediatric Medicine, Radiation Therapy

TABLE 3. Consulting service

Consulting service	Number of consults (% of total)	
Cardiology	80	(32%)
Infectious Disease	32	(13%)
Gastroenterology	24	(10%)
Pulmonary	22	(9%)
General Medicine	18	(7%)
Endocrinology	15	(6%)
Nephrology	14	(6%)
Oncology	14	(6%)
Hematology	13	(5%)
Liver Disease	10	(4%)
Rheumatology/Immunology	9	(4%)
	251	(100%)

TABLE 4. Stimulus for consultation

Consult stimulus	Number of consults (% of total)	
Evaluation of old disease	91	(36%)
Evaluation of new disease	39	(16%)
Abnormal sign or symptom	23	(9%)
Abnormal lab test	48	(19%)
Abnormal sign or symptom and abnormal lab test	23	(9%)
Other	27	(11%)
Totals	251	(100%)

TABLE 5. Purpose of consultation

Consult purpose	Number of consults (% of total)	
Diagnosis	32	(13%)
Prognosis/preoperative	48	(18%)
Management/therapy	45	(19%)
Procedure	7	(3%)
Diagnosis and management	84	(33%)
Other	35	(15%)
Totals	251	(100%)

TABLE 6. Distribution of consultation purposes by consulting service

Consulting service	No. of consults	Total no. of consult purposes	Diagnosis	Prognosis/ Pre-op	Management	Procedure	Uncertain
General Medicine	18	25	6	4	**14**	0	1
Pulmonary	22	35	14	3	15	2	1
Nephrology	14	25	**11**	0	**14**	0	0
Infectious Disease	32	50	**23**	0	**27**	0	0
Gastroenterology	24	36	16	1	10	**9**	0
Cardiology	80	107	21	**53**	31	1	1
Endocrinology	15	21	10	0	11	0	0
Liver Disease	10	16	5	2	6	**3**	0
Hematology	13	17	**10**	2	4	1	1
Oncology	14	23	7	1	**13**	1	1
Rheumatology/ Immunology	9	13	6	0	7	0	0
Totals	251	368	129	66	152	17	5

TABLE 7. Initial consult note

Initial consult note written by:	% of all consults (N=251)
Student	18
Resident	14
Fellow	35
Attending	33
Total	100%

TABLE 8. Consultant follow-up

Consulting service	Number of follow-up notes 0	1	2-5	>5	Totals
General Medicine	1	6	7	4	18
Pulmonary	3	5	5	9	22
Nephrology	0	1	10	3	14
Infectious Disease	7	6	14	5	32
Gastroenterology	2	10	9	3	24
Cardiology	22	40	11	7	80
Endocrinology	3	6	3	3	15
Liver Disease	1	2	4	3	10
Hematology	2	3	7	1	13
Oncology	5	6	2	1	14
Rheumatology/ Immunology	2	4	3	0	9
Totals	48	89	75	39	251

TABLE 9. Association of additional medical consults with average length of stay

Consulting Service	Percent of patients receiving other medical consults	Average length of hospital stay (days)
General Medicine	33 (6/18)	28
Pulmonary	36 (8/22)	17
Nephrology	29 (4/14)	15
Infectious Disease	47 (15/32)	30
Gastroenterology	46 (11/24)	34
Cardiology	20 (16/80)	16
Endocrinology	67 (10/15)	19
Liver Disease	70 (7/10)	22
Hematology	62 (8/13)	34
Oncology	7 (1/14)	18
Rheumatology/Immunology	44 (4/9)	16
Totals	36 (90/251)	22

TABLE 10. Distribution of diagnostic recommendations by consulting service

Consulting service	Total diagnostic recommendations (in 183 consults*): Exam	Biopsy	Endoscopy	Blood Tests	X-ray	Body Fluid Tests	Physiologic Function Tests	Other	Total
General Medicine	4	0	0	12	2	6	5	0	29
Pulmonary	2	3	3	16	11	8	9	4	56
Nephrology	3	1	0	9	3	18	0	0	34
Infectious Disease	1	0	1	18	13	22	0	1	56
Gastroenterology	3	4	13	9	8	0	1	1	39
Cardiology	4	0	0	16	21	3	12	0	56
Endocrinology	4	0	0	15	2	3	2	0	26
Liver Disease	0	4	0	9	6	1	0	0	20
Hematology	3	6	0	12	1	1	0	0	23
Oncology	3	1	0	4	14	1	0	0	23
Rheumatology/ Immunology	2	0	0	9	3	2	1	0	17
Totals	29	19	17	129	84	65	30	6	379

* 68 consults had no diagnostic recommendations.

TABLE 11. Compliance with diagnostic recommendations (in 185 consults*)

Type of recommendation	Done by consulting service	Done† by requesting service	Not done	Total
Exam	8	19	2	29
Biopsy	14	4	0	18
Endoscopy	11	3	1	15
Blood tests	1	117	10	128
X-ray	3	59	20	82
Body fluid test	4	53	8	65
Physiologic function test	9	16	3	28
Other	0	5	1	6
Totals	50	276	45	371**

* 68 consults had no diagnostic recommendations.

† Done partially or completely by the requesting service.

** 8 recommendations could not be complied with.

TABLE 12. Interpretation of diagnostic recommendations

Consulting service	Number of recommendations: Interpreted (%)	Not interpreted (%)	Total
General Medicine	14 (87%)	2 (13%)	16
Pulmonary	35 (87%)	5 (13%)	40
Nephrology	17 (74%)	6 (26%)	23
Infectious Disease	26 (72%)	10 (28%)	36
Gastroenterology	20 (87%)	3 (13%)	23
Cardiology	15 (65%)	8 (35%)	23
Endocrinology	13 (87%)	2 (13%)	15
Liver Disease	13 (87%)	2 (13%)	15
Hematology	13 (81%)	3 (19%)	16
Oncology	5 (83%)	1 (17%)	6
Rheumatology/Immunology	7 (78%)	2 (22%)	9
Totals	178 (80%)	44 (20%)	222*

* 104 diagnostic recommendations required no interpretation.

TABLE 13. Management recommendations
(in 206 consults with at least one management recommendation)

Management Recommendation	Therapeutic manipulation						
	Start	Stop	Continue changed	Continue unchanged	Do not start	Not applicable	Total
Drugs	121	33	44	37	10	0	245
Surgery	3	2	1	57	0	0	63
Respiratory	7	1	1	2	0	0	11
Transfusion	5	1	11	0	0	0	17
Other*	14	3	4	1	6	3	31
Total	150	40	61	97	16	3	367

*Includes "physical therapy," "radiation therapy," "dialysis," and "other."

TABLE 14. Compliance with consultants' management recommendations

A. Compliance vs. management recommendation

Management recommendation	Compliance: Yes	No	Total
Drugs	215	25	240
Surgery	60	2	62
Respiratory therapy	11	0	11
Transfusion	16	1	17
Other	27	3	30
Totals	329	31	360*

* Seven management recommendations could not be complied with.

B. Compliance vs. therapeutic manipulation

Therapeutic manipulation	Compliance: Yes (%)	No	Total
Start	129 (88%)	17	146
Other†	200 (93%)	14	214
Totals	329 (91%)	31	360

$\chi^2 = 2.87$ $P > .1$

† Stop, continue changed, continue unchanged, do not start, and not applicable.

C. Compliance vs. dosage or duration information

	Compliance: Yes (%)	No	Total
Dosage and/or duration specified	137 (91%)	14	151
Neither dosage nor duration specified	14 (64%)	8	22
Totals	151 (87%)	22	173

$\chi^2 = 12.70$ $P < .005$

TABLE 15. Diagnostic impact of consultations for diagnostic purposes (N=129)

Impact	Number of consults (%)
Changed diagnosis	48 (37%)
Confirmed diagnosis	34 (26%)
Ruled out diagnosis	29 (22%)
Uncertain	6 (5%)
No impact	12 (9%)
Totals	129 (100%)

TABLE 16. Diagnostic impact of consultations not for diagnostic purposes (N=122)

Impact	Number of consults (%)
Positive impact*	37 (30%)
No impact	84 (69%)
Uncertain	1 (1%)
Totals	122 (100%)

*Changed, confirmed, or ruled out diagnosis.

TABLE 17. Management impact of consults for management purposes (N=152)

Impact	Number of consults (%)
Changed management	98 (64%)
Confirmed management	28 (18%)
No impact	26 (17%)
Totals	152 (100%)

TABLE 18. Management impact of consults not for management purposes (N=99)

Impact	Number of consults (%)
Positive impact*	47 (47%)
No impact	52 (53%)
Totals	99 (100%)

* Changed or confirmed management.

TABLE 19. Impact on management vs. number of follow-up notes

Number of follow-up notes	Impact on management: Positive*	None	Totals
0-1	54 (75%)	18	72
2-9	72 (90%)	8	80
Totals	126 (83%)	26	152

$\chi^2 = 6.01$ $P < .05$

*Changed or confirmed management.

V. DISCUSSION

This study analyzed the consultation process in order to provide information about the content of consultation to non-medical services in a teaching hospital; such information can be utilized by program directors to focus their efforts in training internists to function effectively as consultants. The study also looked at factors which may improve the consultation process; those involved in consultation, both the consultant and the consultee, can use such information to improve the process.

First, we found that patient management was the most common function of the medical consultant. Overall 61 percent (152/251) of consults requested aid in management, and 51 percent (129/251) requested aid in diagnosis. Only 3 percent (7/251) requested the consultant to perform a procedure. More than three-fourths of consults to general medicine, nephrology, infectious disease, and oncology requested aid in the management of clinical problems — in these specialties patient management is a key role of the consultant. Of all specialties, only hematology and gastroenterology were consulted more often for diagnostic aid than for aid in clinical management. Thus, training in consultative medicine should continue to emphasize the importance of clinical problem-solving, especially in the areas of clinical management and diagnosis. Less emphasis may be necessary for the performance of procedures, although certain medical subspecialties will continue to perform a larger number of these functions.

We also found that in 52 percent of all consultations the sole reason for the consultation request was the evaluation of previously diagnosed disease; in 37 percent of all consultations the reason for the request was an abnormal test result or an abnormality found on examining the patient. Thus, the consultative process involves the evaluation of laboratory findings and the assessment of already-established disease. These findings stress the importance for the clinician of an understanding of laboratory medicine and the interpretation of diagnostic tests in hospital-based populations. Consultative training should emphasize the assessment of the efficacy of diagnostic technology, such as the operating characteristics of tests (i.e. sensitivity and specificity) and the influence of disease prevalence rates.

Other studies have examined the reasons for consultation requests. Perlman,[52] in looking at consultation requests to a pulmonary subspecialty service, discovered that 99 percent of consults requested aid in diagnosis and 47 percent requested aid in management. Rudd,[53] in examining peri-operative consultations on diabetic patients by a general medicine service, found that 29 percent of consults requested aid in diagnosis and 76 percent requested aid in management. As stated above, in our study we found that 51 percent of consults requested aid in diagnosis and 61 percent requested aid in management. Perlman's finding that diagnosis was the major purpose of

consultations may have been a function of the specialty service he examined, or of the patterns of referral in the hospital where the study took place. Rudd's finding of a low number of diagnostic consults probably reflects the patient population in the study; all the patients were previously diagnosed diabetics in whom assistance in diabetic management was requested.

Another major finding of our study was that consultants almost always provide important assistance in the diagnosis and management of patient problems. For 86 percent of all consultations in which the consultee requested aid in diagnosis, consultants provided either a diagnosis of the problem or a narrower range of possible diagnoses. In 82 percent of all consultations in which the consultee requested aid in the management of a clinical problem, consultation led either to a change in management or to verification by the consultant that the therapy instituted by the requesting service was correct. In addition, consultants often gave assistance in diagnosis and management even when not specifically requested; 30 percent of consultations for which aid in diagnosis was not requested provided diagnostic information; almost half (47 percent) of consultations for which aid in management was not requested provided assistance in management. Finally, consultants diagnosed new problems and suggested therapy for them in about one-fifth of cases.

As stated above, analysis of the factors which will improve

the consultative process can provide the participants in consultation with a means of increasing the usefulness of their consultation. First, we concluded that the contribution of consultation to patient management could be enhanced by close follow-up of the patient by the consultant. Table 19 demonstrates a statistically significant difference between the effects on patient management of consultations which provided two or more follow-up notes and those consultations which provided one or no follow-up notes. We also concluded that factors which improved compliance with therapeutic recommendations would increase the contribution of consultation to patient management. By our definition, a consultation was useful in patient management if the consultee followed the management recommendations of the consultant; logically, therefore, improving compliance would increase the frequency of useful consultations. We discovered that specification of dosage or duration for therapy leads to better compliance with therapeutic recommendations (Table 14-C), hence to more useful consultations. Popkin,[30] Rudd,[53] and Perlman[52] all suggest in other studies that specification of dosage when recommending therapy would increase compliance, although none supply data to support that conclusion.

Conversely, we determined that orders to initiate therapy were complied with as frequently as orders to stop, change, or continue therapy. This result contrasts with the findings of Popkin et al.,[30] in their study of psychiatric consultants' recommendation for psychotropic medication. He found a

statistically significant difference between compliance with orders to initiate therapy and those to stop, change, or continue therapy. Several differences in the two studies could account for the disparity. The consultants recommending therapy were psychiatrists in Popkin's study and internists in our study; the physicians requesting consultation were from the medical, neurologic, and surgical fields in Popkin's study, but were solely from non-medical disciplines in our study; last, the recommended therapy in Popkin's study was psychotropic medication, whereas in our study it consisted of a wide range of drugs and non-pharmacologic therapy.

We also determined that neither close follow-up of patients, attempts to diagnose the patient's problem with simple tests before the consultation, nor compliance with the consultant's recommendations for diagnostic tests had any statistically significant effect on whether the consultation ultimately provided a diagnosis of the patient's problem. This is not to suggest that physicians should not comply with consultant's diagnostic suggestions; it does imply, however, that strict adherence to those suggestions may not be necessary to achieve a useful diagnostic result. Rather, physicians' compliance with recommendations for tests should be "tempered... in accord to their own unique knowledge of the patient's special characteristics."[54]

Last, both in planning the training of medical consultants and in attempting to make the greatest impact on patient care for

the least cost, it is useful to know the extent to which patients are seen by more than one medical consultant. In our study we found that over one third of patients were seen by more than one medical consultant. If cost is a major factor, caring for such multiple medical problems with a "committee of consultants"[45] may give way to consolidation of care under the aegis of a single physician. Some authors[38,43,50,51] have suggested that, on average, the general internist is more capable of diagnosing and treating a broad range of medical problems, whereas the subspecialist can diagnose and treat a more narrow range of diseases in depth; in fact, we found that consultants in general internal medicine discovered extra problems in patients in 56 percent of their cases, while the consultants from all other services together found new problems in only 18 percent of their cases.

An examination of consult demographics showed several other interesting facets of the consultations performed at our Center. First, we found that individual consulting services saw markedly different patient populations; thus, the majority of patients seen by infectious disease, pulmonary disease, liver disease and rheumatology/immunology were patients on internal medicine services, while the majority of patients seen by general medicine, cardiology, endocrinology and oncology were non-medical (Table 1). The differences may have resulted from the differences in the distribution of disease processes between medical and non-medical services; it may also be a

result of differing attitudes toward referral to individual consulting services between the medical and non-medical house staff.

We found that 76 percent of patients were seen within one day of the consult request; this finding is similar to that of several other studies[38,46,53] in which virtually all consult requests were answered within one day.

We also noted that participation in the consultation process was shared by students and physicians at all levels of training; Table 7 shows, however, that the majority of initial evaluations were performed by subspecialists.

There is presently a nationwide concern over the proper allocation of resouces and manpower to health care. Consultation accounts for a large proportion of the patient care delivered by internists, both those who have subspecialty practices and those who practice general internal medicine. Mendenhall et al.,[2] in their study of how internists allocate their time, found that 19 percent of all internists' patient encounters are for consultation care; several specialties of internal medicine (gastroenterology, pulmonary disease, and infectious disease) examined in the study devoted more than one-third of their time to consultation. Therefore the investigation of the consultation process should help answer some of the key questions about consultation and its contribution to patient care, by showing the tremendous impact of consultation on the diagnosis

and management of clinical problems.

We have also provided information which can prove useful to those responsible for training internist in consultation. To provide proper training, directors of training programs must understand the consultation process and factors which lead to successful consultations. These directors can look to the studies of Mendenhall et al.[2] to determine how they should allocate time to "primary care" in the training of internists but it is only through this and other studies that they will be able to determine the proper allocation of training time and resources in teaching consultation, such as in the areas of interpretation of laboratory test, perioperative management, and most important, in the management of clinical problems.

VI. FUTURE CONSIDERATIONS

This study has laid some of the groundwork for future studies of consultation. We have demonstrated the importance of diagnosis and management of patient problems in the work of the consultant. We have investigated how consultation contributes to the diagnosis and management of such problems. We have explored factors such as compliance with recommendations and exact specification of therapy which may lead to more successful consultations.

However, further work must be done in these areas as well as several key areas which were not investigated in our study. Most important, researchers must undertake studies of the outcome of consultation — its effect on the patient's health as measured by such indices as morbidity, mortality, and health status. To be meaningful, these should be prospective, controlled studies. With such studies, the effects of factors such as those mentioned above (compliance, dosage specification, etc.), on the outcome of consultation can be analyzed. Finally, costs of consultation to the patient and the health-care system can be investigated, in order to assess the cost-benefit ratio of consultation. Such studies might include further exploration of the hypothesis that a general medical consultant is more cost-efficient than a group of subspecialty consultants, while providing similar benefits to the patient. With the present and growing concern about the allocation of resources

and manpower in health care, such cost-benefit studies may be increasingly important in determining the future of medical consultation.

APPENDIX I-A

EXTRACTOR_____ I.D. ( ) ( ) ( ) ( )

DATE____/____/____

MEDICAL CONSULTATION STUDY

EXTRACTION FORM

I. PATIENT DEMOGRAPHICS

Hospital Unit No._____-_____-_____ NAME OF PATIENT_____

Date of Birth____/____/____ AGE_____ RACE ( ) SEX ( )

Hospital Service_____ Status: WARD ( ) PVT ( )

Date of Admission____/____/_____ Date of Discharge____/____/____

II. CONSULT DEMOGRAPHICS (Z.T. = TIME OF CONSULT REQUEST)

Requesting Service_____ Consulting Service_____

Date of Request____/____/____ Date of Consult____/____/____ No. of DYS_____

First Consult Note: STUDENT ( ) RESIDENT ( ) FELLOW ( ) ATTENDING ( )

Addn'l Consult Notes: STUDENT ( ) RESIDENT ( ) FELLOW ( ) ATTENDING ( )

No. Follow-Up Notes:_____

Other Medical Consults Requested: YES ( ) NO ( )

If Yes, Give Date, Service and Problem:_____

_____

_____

III. CONSULT REQUEST

Purpose: DIAGNOSIS ( ) PROGNOSIS ( ) THERAPY ( ) PROCEDURE ( )

TEACHING ( ) OTHER ( )

Problem:_____

_____

_____

EXTRACTION FORM

IV. PATIENT CLINICAL CHARACTERISTICS (Problems, Disease Labels, Medications)

V. CONSULT RECOMMENDATIONS

WORK-UP: LABORATORY TESTS

PROCEDURES

OTHER

MANAGEMENT:

ADHERENCE WITH RECOMMENDATIONS

LAB:

PROCEDURE:

THERAPY:

EXTRACTION FORM

VI. IMPACT OF CONSULTATION

Change in Dx: YES ( ) NO ( ) UNC ( )_____

_____

Addn't Dx: YES ( ) NO ( ) UNC ( )_____

_____

_____

Change in Mgt: YES ( ) NO ( ) UNC ( )_____

_____

_____

Addn'l Mgt Recs: YES ( ) NO ( ) UNC ( )_____

_____

_____

OTHER:

APPENDIX I-B

ADDITIONAL INFORMATION EXTRACTED

1. Consult stimulus.

2. Pre-consult data base (included in Patient Clinical Characteristics).

3. Interpretation of diagnostic recommendations (included under Adherence with Recommendations).

4. Specific prognostic criteria (included under Consult Recommendations).

5. Teaching references given (included under Consult Recommendations).

6. Impact of Consultation section was altered slightly:

   A. "Change in Dx: Yes/No/Unc" became
      "Impact on Diagnosis: None/Changed/Confirmed/Rule-Out/Uncertain"

   B. "Change in Mgt.: Yes/No/Unc" became
      "Impact on Management: None/Changed/Confirmed/Uncertain"

   C. "Additional Management Recs.: Yes/No/Unc" became
      "Management recommendations on additional problems: None/Partial/Yes"

APPENDIX I-C

EXTRACTION CRITERIA

Note: No explanation is given for self-evident notation.

I. Patient Demographics

1. Information in this section was derived from admitting information printed on the discharge summary.

II. Consult Demographics

1. Requesting service: Determined from discharge summary.

2. Consulting service: Preselected from consultation lists (see Materials and Methods).

3. Date of request: Date of request for consultation determined from consultation-referral form in chart. If sheet unavailable, determined from progress notes or from daily orders.

4. Date of consult: Date of first consultant note.

5. No. of days: Number of days between "Date of request" and "Date of consult".

6. First consult note: Identity of first consultant was determined: a) from specific written notation (e.g. Jones, YMS IV or CC = student; Smith, I.D. Fellow); b) from lists of faculty, fellows, and housestaff at Y-NHH during the study period. Also, note if attending cosigned the first consultant note.

7. Additional consult notes: Identified as above. Number of notes by consultant category recorded.

8. No. follow-up notes: Total of "additional consult notes".

III. Consult Request

1. Purpose: Categorized as follows:

Diagnosis -- the requesting service wishes the consultant to formulate a diagnosis for the problems, or it wishes a previous diagnosis to be confirmed or ruled out.

Prognosis -- the requesting service wishes the consultant to give a prognosis for the course of a patient with known disease; or they request a preoperative evaluation of a surgical candidate.

Therapy -- the requesting service asks the consultant to give advice on the therapy or management of the patient; this includes both the institution of new therapy as well as recommendations about previously instituted therapy.

Procedure -- the requesting service asks the consultant to perform a procedure or evaluate the need for a procedure.

Teaching -- if a consultation is requested for teaching purposes only.

Other -- any purpose not included above.

The consult purpose was inferred: a) from information on the consultation-referral sheet; b) from specific notation in the progress notes (e.g. "Problem #3 -- Unexplained anemia. Plan: Hematology consult.") More than one purpose could be recorded for a consult.

2. Problem: Patient problems recorded on the consultation-referral sheet. If no sheet could be found, progress notes were examined for evidence of specific problems for which consultation was called.

3. Stimulus for consult: Defined as event or set of data which induced the requesting service to ask for a consultation. As

in the case of "consult purpose", it was necessary to infer the stimulus from information on the consultation-referral sheet or from information in the progress notes. More than one stimulus could be recorded.

Categorized as follows:

Evaluation of old disease -- the consultant is asked to assess or manage some aspect of a disease which was diagnosed prior to admission.

Evaluation of new disease -- the consultant is asked to assess or manage some aspect of a disease which has been diagnosed during the present admission.

Abnormal sign or symptom -- the consultant is asked to assess or manage an abnormality, found on physical exam or reported by the patient, which is not part of a previously diagnosed disease.

Abnormal lab test -- the consultant is asked to assess or manage an abnormal result of a diagnostic test; this includes blood tests, radiologic tests, biopsies, etc.

(If there is a clear cause-effect relationship implied or stated in either the progress notes or the consultation-referral sheet between a previously diagnosed disease process and the abnormal sign, symptom, or lab test, then the consult stimulus is recorded as "evaluation of old disease" or "evaluation of new disease".)

Uncertain -- extractor is uncertain about stimulus for consult.

IV. Patient Clinical Characteristics (Problems, disease labels, medications):

This section includes a summary of the patient's past history and hospital stay, concentrating on the medical problems for which the consultation was requested. Included here is information in the chart prior to the first consult note, as well as information collected by the requesting service which has been first noted by the consultant in his initial note (e.g. the results of recent laboratory tests). This section includes data used to determine "adequate pre-consult data base" (see Appendix II-B).

V. Consult Recommendations

This section includes all diagnostic and therapeutic recommendations made by the consulting service in its notes, as well as any statements about diagnoses or differential diagnoses made by the consultants; it also includes statements about prognoses or operative risk (including specific prognostic criteria); finally, it includes any literature references suggested by the consulting service.

1. Adherence with recommendations: For each recommendation made in the section above, it was noted whether the recommendation had been carried out.

Tests or procedures were considered done: a) if test results were in the chart; b) if test results were referred to in the chart (e.g. "calcium level was normal" written in a progress note); if tests were ordered in the daily orders. The authors realize that the last of these criteria may have resulted in some tests being

considered done when, in fact, they were merely ordered but not done. Likewise, other tests could have been performed, and the results seen by house officers or consultants, without any note appearing in the chart to indicate that the test had been done. However, since this study was limited to information appearing in the chart, we were forced to consider intent to comply with recommendations (as evidenced by daily orders) as equivalent to actual compliance.

Therapeutic or management recommendations were considered done: a) if they were written in the daily orders; b) if they were written on medication sheets (filled out by nurses who administer drugs); c) if noted elsewhere in patient's chart. The first criterion applies to all types of therapeutic recommendations; the second only to drugs; the third to all non-drug therapeutic recommendations (e.g. transfusion, dialysis, physical therapy). As above, intent to comply was considered equivalent to compliance.

If tests or procedures were done, it was noted whether they were done by the requesting service or the consulting service and whether the consulting service had interpreted the test results. The consultant was considered to have interpreted the results of the tests if: a) he interpreted the actual results in a note, after the results had been collected; b) he interpreted the various possible results of the tests before the results had been collected; c) he interpreted an in-patient test for which results were received after the patient had been discharged, in an out-patient

follow-up note. Because of the probable discrepancy noted above between the number of tests recorded as "done" and the actual number of tests completed, the percentage of completed tests that were interpreted will necessarily be less than 100 percent.

VI. Impact of Consultation

1. Impact on diagnosis: Categorized as follows:

None -- the consultant does not affect the diagnosis of the problem(s) for which he is consulted -- he neither "changes" the diagnosis, "confirms" the diagnosis, or "rules out" other diagnoses (see below).

Changed -- the requesting service has made a previous diagnosis of the problem, which is changed as a result of the consultation (either in a direct statement by the consultant, or as the result of diagnostic recommendations by the consultant); or, the requesting service has made no previous diagnosis, and a new diagnosis is made as a result of the consultation.

Confirmed -- the requesting service has previously made a diagnosis which is confirmed as a result of the consultation.

Ruled out -- the consulting service rules out certain diagnoses, but neither "confirms" a previous diagnosis nor "changes" the diagnosis (see above).

Uncertain -- the extractor is uncertain whether the consultation had an impact on diagnosis.

2. Additional problems: Any problems newly diagnosed by the consulting service that do not include the problems they were asked to evaluate initially.

3. Impact on management: Categorized as follows:

None -- the consulting service does not affect the management or therapy of the patient, either by "changing" it or by "confirming" it (see below).

Changed -- the consulting service alters the requesting service's current management of the problem for which they were consulted; or, the consulting service institutes therapy in cases where none has been given previously.

Confirmed -- the requesting service continues its current management of the patient as a direct result of consultant recommendations (i.e., a case in which the requesting service maintained its current drug regimen while ignoring the recommendations of the consultant to start a new drug would be recorded under "none" rather than "confirmed", since the consultant's recommendations had no impact on the actual management of the patient.).

Uncertain -- the extractor is uncertain whether the consultation has an impact on the patient's management.

4. Management of additional problems: Categorized as follows:

None -- the consultant makes no management recommendations for the "additional problems" he had diagnosed.

Partial -- the consultant makes management recommendations for some but not all of the "additional problems" he has diagnosed.

Yes -- the consultant makes management recommendations for all of the "additional problems" he had diagnosed.

APPENDIX II-A

Draft 4 — CODING FORM — CONSULT STUDY — March 5, 1980

I.D. NUMBER [ ] [ ] [ ] (1 2 3)

AGE [ ] [ ] (4 5)

RACE [ ] (6) 1=White 2=Black 3=Hispanic 4=other 5=UNK

SEX [ ] (7) 0=M 1=F

WARD STATUS [ ] (8) 1=Ward 2=Private 3=UNC

LENGTH OF HOSPIT [ ] [ ] (9 10) 99 = > 98 days

REQ. SVC [ ] [ ] (11 12)
1=General surgery
2=Cardiovascular/ thoracic surgery
3=Orthopedics
4=Neurosurgery
5=Plastic surgery
6=ENT
7=Urology
8=Pediatric surgery
9=Neurology
10=Psychiatry
11=Ob-Gyn
12=Pediatrics
13=Dermatology
14=Ophthalmology
15=Radiation therapy

CONS. SVC [ ] [ ] (13 14)
1=General internal medcine
2=Pulmonary
3=Renal
4=Infectious disease
5=Gastroenterology
6=Cardiology
7=Endocrine
8=Liver
9=Hematology
10-Oncology
11=Rheumatology/ Immunology

CONS. DLY [ ] (15) 9 = > 8 days

1st CONS. NOTE [ ] (16) 1=Stud. 2=Resid. 3=Fellow 4=Att. 8=UNC

ATTEND. NOTE [ ] (17) 0=No 1=Yes

NO. OF F/U NOTES [ ] (18) 9 = > 8 F/U Notes

OTHER MED. CONS. [ ] (19) 0=None 1=One, etc.

CONS. PURP. #1 [ ] (20)

CONS. PURP. #2 [ ] (21)

0=None 1=Dx 2=Px/preop 3=Mgt/Tx 4=Pro 5=teaching 8=UNC

ADEQ DATA BASE [ ] (22) 0=No 1=Yes 2=Partial 9=UNK

CONS. STIM. #1 [ ] (23)

CONS. STIM. #2 [ ] (24) 1=Eval. old dis 2=Eval. new dis 3=Abn. sign or Sx 4=Abn. lab test 8=UNC

POST-OP PROB [ ] (25) 0=No 1=Yes 8=UNC 9=Not applicable

CONS. Dx REC #1 [ ] (26) 0=None 1=Exam 2=Bx 3=Endoscopy 4=Blood tests 5=X-ray 6=Body fluid tests 7=FXN test 8=Other

REC #1-COMPL. [ ] 27
0=Not done
1=Done by consulting service
2=Done completely by requesting service
3=Done partially by reqesting service 9 = N/A

REC #1-INTERP [ ] 28
0=Not int.
1=Interpreted
9=Not applicable

CONS. Dx REC #2 [ ] 29
COMP-2 [ ] 30
INTERP-2 [ ] 31

CONS. Dx REC #3 [ ] 32
COMP-3 [ ] 33
INTERP-3 [ ] 34

CONS. MGT REC #1 [ ] 35
0= None
1=Drugs
2=Surgery
3=Resp.
4=Transf.
5=Dialysis
6=Physical therapy
7=Rad. Tx
8=Other

Tx MANIP. #1 [ ] 36
1=Start
2=Stop
3=Cont. charged
4=Cont. unch.
8=UNC
9=N/A

DOSE [ ] 37
0=No
1=Yes
9=N/A

DURATION/ENPONT SPECIFIED #1 [ ] 38
0=No
1=Yes
9=N/A

COMP. #1 [ ] 39
0=Not done
1=Done
9=N/A

MRT REC #2 [ ] 40
Tx MANIP. #2 [ ] 41
DOSE #2 [ ] 42
DURATION #2 [ ] 43
COMP. #2 [ ] 44

MGT REC #3 [ ] 45
Tx MANIP. #3 [ ] 46
DOSE #3 [ ] 47
DURATION #3 [ ] 48
COMP. #3 [ ] 49

SPECIFIC PROG CRIT [ ] 50
0=No
1=ASA/Dripps
2=Goldman
7=Other
8=UNC
9=N/A

REF. [ ] 51
0=No
1=Yes
8=UNC

IMP. ON Dx [ ] 52
0=No impact
1=Chng dx
2=Conf dx
3=R/O other dx
8=UNC

NO. ADDL. PROB. [ ] 53
0=None
1=One, etc.

IMP. ON MGT [ ] 54
0=No impact
1=Chng MGT
2=Conf MGT

ADDL. MGT RECS [ ] 55
0=No
1=Yes
2=Partial
3=N/A

APPENDIX II-B

CODING CRITERIA

I.D. Number (1-3): three digit number from 001 to 251

Age (4-5): age of patient, rounded down. If greater than 99, code as 99.

Race (6): see coding form

Sex (7): see coding form

Ward Status (8): see coding form

Length of Hospitalization (9-10): calculated (in days) from "Date of Admission" to "Date of Discharge". If greater than 99, code as 99.

Requesting Service (11-12): see coding form

Consulting Service (13-14): see coding form

Consult Delay (15): from "Number of Days" on extraction form. If greater than 9, code as 9.

First Consult Note (16): see coding form

Attending Note (17): code "Yes" if attending wrote first consult note, cosigned first consult note, wrote an "Additional Consult Note."

Number of Follow-Up Notes (18): see coding form

Other Medical Consults (19): number of other medical consults listed on extraction form.

Consult Purpose #1 (20) and #2 (21): In many cases there were two purposes noted for the consult (e.g. "diagnosis" and "therapy") and these were coded as consult purpose #1 and #2. There was no difference in importance attached to the two purposes listed. In the rare

cases where more than two purposes for the consult were noted, an attempt was made to eliminate the least important purposes until only two were left; if this was impossible, the most important purpose was called purpose #1 and purpose #2 was coded as uncertain. If only one purpose was noted, consult purpose #2 was coded as "none".

Adequate Pre-Consult Data Base (22): As noted in Materials and Methods, an implicit set of standards was used to determine if the requesting service had made a reasonable attempt to provide the consultant with an adequate data base. This data base was considered, in general, to include those easily obtained, simple tests which could have been used to diagnostically evaluate the patient's problem. A review of the cases in this study shows that the tests included were: complete blood count, platelet count, prothrombin time and partial thromboplastin time; serum electrolytes, glucose, BUN, creatinine, calcium and phosphate; serum liver function tests (bilirubin, SGOT, LDH, alkaline phosphatase), serum thyroid function tests; arterial blood gases; urinalysis; nasogastric aspirate; lumbar puncture; chest x-ray; electrocardiogram; and microbial cultures of pertinent body fluids (blood, CSF, urine, nasal drainage, etc.). All these tests are relatively simple and quick; in fact, the large majority of them are standard tests done on admission to many hospitals. Code as follows:

No (=0): none of the simple tests relevant to the problem had been done prior to the consultation.

Yes (=1): all of the simple tests relevant to the problem had been done prior to the consultation.

Partial (=2): some, but not all, of the simple tests relevant to the problem had been done prior to the consultation.

Unknown (=9): none coded as unknown.

Consult Stimulus #1 (23) and #2 (24): see coding form. There is no difference in importance between consult stimulus #1 and consult stimulus #2.

Post-Op Problem (25)

Code as follows:

Yes (=1): If either the initial problem for which the consult was requested or an "additional problem" (see Appendix I-C) is directly related to a complication of surgery.

No (=0): if the patient is initially seen postoperatively and has no problems directly related to a complication of surgery.

Uncertain (=8): if either the initial problem for which the consult was requested or an "additional problem" may be related to a complication of surgery, but the cause-effect relationship is uncertain.

Not Applicable (=9): if patient is not seen postoperatively.

Consult Diagnostic Recommendation #1 (26) #2 (29) and #3 (32): Diagnostic recommendations#1, #2, and #3 were selected for the total group of recommendations on the extraction form. In cases where some recommendations could not be coded, we excluded those recommendations of the least diagnostic importance in the particular case in question.

There is no difference in importance among diagnostic recommendations #1, #2, and #3.

Code as follows:

None (=0): no recommendation made

Examinations (=1): includes: physical examination, both general and specialized (e.g. neurologic exam); referral to other specialists or recommendation for further consultation; referral to outpatient clinics for follow-up.

Biopsy (=2): includes any type of biopsy, including those performed by endoscopy.

Endoscopy (=3): includes fiberoptic bronchoscopy, laryngoscopy, peritoneoscopy, endoscopy of the upper and lower gastrointestinal system, cystoscopy, and arthroscopy.

Blood Tests (=4): includes all blood tests, including blood chemistry, hematology, serology, and microbiology. If more than one blood test was recommended (which was usually the case), then all blood tests in one subgroup mentioned above would be considered as a single diagnostic recommendation (e.g. serum electrolyte, BUN, and creatinine would be considered a single "blood test"; likewise, serum IgG, rheumatoid factor, and antinuclear antibody would form a single test).

X-ray (=5): includes conventional and contrast radiography, ultrasound, tomography and radioactive isotopic scans. As in the case of "blood tests", multiple radiologic tests from one of the subgroups above might be considered a single "x-ray" (e.g. upper GI series, small bowel follow through and barium enema).

Body Fluid Tests (=6): includes chemical, serological, microbiological or microscopic tests on any type of normal or abnormal body fluid (e.g. urine, sputum, CSF, pleural effusion, stool).

Function Tests (=7): includes all types of physiologic function tests not performed by means of blood tests, body fluid tests, or x-ray; these include electrocardiography , pulmonary function tests, dye-dilution cardiac output determination, etc.

Other (=8): includes all tests not covered by previous definitions.

Compliance with Diagnostic Recommendation #1 (27), #2 (30), #3 (33) Code as follows:

Not Done (=0): if no parts of the ordered tests were done.

Done by Consulting Service (=1): if recommended tests were done by the consulting service.

Done Completely by Requesting Service (=2): if all parts of recommended tests were done by requesting service.

Done Partially by Requesting Service (=3): if some, but not all, parts of recommended tests were done by requesting service.

Not Applicable (=9): if corresponding diagnostic recommendation codes as "none".

Interpretation-Diagnostic Recommendation #1 (28), #2 (31), and #3 (34) Code as follows:

Not Interpreted (=0): if the recommended test has been done and there is no interpretation of the test by the consultant.

Interpreted (=1): if the recommended test has been done and the consultant has interpreted the result.

Not Applicable (=9): if the test has not been done, or no diagnostic recommendation was made. Also coded if the results of the recommended test include an interpretation of the results by the department which performed the test (e.g. radiologic tests, pulmonary function tests).

Management Recommendations #1 (35), #2 (40), and #3 (45): As in the care of diagnostic recommendations, an attempt was made to include all management recommendations; if all could not be included, then those deemed to be least important were excluded. Examination of the raw data reveals that only 50 consultations in the study had as many as three management recommendations coded. Thus, in no more than 20 percent of the consults studied did we exclude management recommendations.

Coded as follows:

None (=0): no management recommendation made.

Drugs (=1): includes any pharmacologic substances, excluding standard electrolyte solutions (see below).

Surgery (=2): includes any type of therapeutic or palliative surgery; does not include surgery solely for the purpose of diagnosis.

Respiratory Therapy (=3): includes any non-pharmacologic therapy for the maintenance of the respiratory system, including oxygen delivered in any manner, mechanical ventilation, removal of secretions, and chest percussion.

Transfusion (=4): includes transfusion of blood products

and infusion of water/electrolyte solutions.

Dialysis (=5): includes hemodialysis and peritoneal dialysis.

Physical Therapy (=6): includes muscle strengthening exercises, exercise to increase flexibility, as well as vocational and rehabilitative training.

Radiation Therapy (=7): includes therapy adminstered by means of electromagnetic radiation, either from an external source (e.g. x-ray beam)or internal source (e.g. radium uterine implants).

Other (=8): includes any therapeutic recommendation not described above.

Therapeutic Manipulation #1 (36), #2 (41), and #3 (46)
Code as follows:

Start (=1): if consultant recommended starting new therapy of the type described.

Stop (=2): if consultant recommended termination of previous therapy of the type described.

Continue Changed (=3): if the consultant recommended continuing previous therapy of the type described, but at a different dose or for a different duration.

Continue Unchanged (=4): if the consultant recommended continuing previous therapy of the type described, with no change; this category includes recommendations by pre-operative consultants to continue with planned surgery.

Uncertain (=8): (Since no cases were found in which the type of therapeutic manipulation was uncertain, this category was changed

to represent the recommendation that a certain type of therapy planned for the future should not be started).

Not Applicable (=9): if corresponding management recommendation was coded as "none".

Dose #1 (37), #2 (42), and #3 (47)

Code as follows:

No (=0): if no specific dose or amount of the therapy recommended is given in the recommendation.

Yes (=1): if a specific dose or amount of the therapy recommended is given in the recommendation.

Not Applicable (=2): if corresponding management recommendation coded as "none" or "surgery" or if corresponding therapeutic manipulation is coded as "stop", "continue unchanged", or "uncertain".

Duration/Endpoint #1 (38), #2 (43), and #3 (48)

Code as follows:

No (=0) if a duration for therapy or endpoint for termination of therapy is not given for therapy which will terminate during the hospital stay.

Yes (=1): if duration or endpoint is given.

Not Applicable (=9): if corresponding dose is coded as "not applicable"; if therapy is not continuous, but rather a single event; or if therapy is to be continued indefinitely after discharge from hospital.

Compliance-Management Recommendation #1 (39), #2 (44), and #3 (49): see coding form. Code as Not Applicable (=9) if corresponding management recommendation is coded as "none".

Specific Prognostic Criteria (50)

Code as follows:

No (=0): if purpose of consult was "prognosis" and no specific prognostic index was used.

ASA/Dripps (=1): if ASA/Dripps preoperative risk index used.

Goldman (=2): if Goldman preoperative risk index used.

Other (=7): if other specific prognostic criteria used.

Uncertain (=8): if extractor was uncertain whether specific prognostic criteria had been used.

Not Applicable (=9): if purpose of consult was not "prognostic".

References Given (51)

Code as follows:

No (=0): if consult purpose was "teaching" and no literature references were given.

Yes (=1): if consult purpose was "teaching" and literature references were given.

Not Applicable (=9): if consult purpose was not "teaching".

Impact on Diagnosis (52): see coding form

Number of Additional Problems (53): number of "additional problems" listed (see Appendix I-C).

Impact on Management (54): see coding form

Additional Management Recommendations: see coding form. Code as Not Applicable (=9) if "number of additional problems" is coded as "none".

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